**UNITED STATES DISTRICT COURT**
**DISTRICT OF MINNESOTA**

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| United States of America,<br><br>Plaintiff,<br><br>v.<br><br>Curtis Lee Ferguson,<br><br>Defendant. | Case No. 23-cr-203 (SRN/TNL)<br><br>**Order on Defendant's *Daubert* Motion** |

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SUSAN RICHARD NELSON, United States District Judge

This matter is before the Court on Defendant Curtis Lee Ferguson's Motion Regarding the Government's Proposed Expert Witness Testimony ("Defendant's *Daubert* Motion") [Doc. No. 117]. Based on a review of the files, submissions, and proceedings herein, and for the reasons stated below, the Court denies the motion.

## I. BACKGROUND

### A. Procedural History

Mr. Ferguson was charged by federal indictment on May 31, 2023. (Indictment [Doc. No. 34].) The Indictment alleges that Mr. Ferguson possessed a firearm after he was convicted of three separate felonies: (1) a 2012 Fifth Degree Controlled Substance

Conviction; (2) a 2015 Second Degree Assault Conviction; and (3) a 2021 Domestic Assault conviction. (*Id*. at 2–3.)

The matter is set for trial on May 6, 2024. (*See* January 18, 2024 Trial Notice [Doc. No. 109].) As a part of its case in chief, the Government intends to present forensic evidence that Mr. Ferguson's unique DNA profile was present on both the handgun he is alleged to have unlawfully possessed and on a loaded ammunition magazine recovered with the handgun. Mr. Ferguson objects to the introduction of this evidence under Federal Rule of Evidence 702, as interpreted by the Supreme Court in *Daubert v. Merrell Dow Pharms., Inc.*, 509 U.S. 579 (1993).

At trial, the Government intends to introduce expert testimony from forensic scientist Ross Thomas, a staff analyst at the Minnesota Bureau of Criminal Apprehension ("BCA")'s Forensic Science Laboratory in St. Paul, Minnesota (the "BCA Lab"). In the instant motion, Mr. Ferguson seeks to exclude the Government's proposed DNA testimony from Mr. Thomas. The Court held a *Daubert* hearing on April 8, 2024. At the hearing, Mr. Ferguson and the Government each offered testimony from the following witnesses: Ms. Cynthia Cale for the Defendant, and Dr. Marlijn Hoogendoorn for the Government. (*See Daubert* Hearing Transcript ("Tr.") [Doc. No. 126].) Ms. Cale and Dr. Hoogendoorn testified regarding the reliability of Mr. Thomas's methodology in generating the challenged forensic evidence.

### B. Forensic DNA Analysis at the BCA

The BCA Lab is an ANAB-accredited ISO/IEC 17025 forensic testing laboratory.[1] (*See* Directory of Accredited Organizations, https://search.anab.org (last accessed April 26, 2024).) When analyzing DNA evidence, the BCA Lab uses a probabilistic genotyping software program called STRmix. (Def. Ex. 14.) The BCA Lab completed an internal validation of its STRmix software and procedures in 2020, which concluded that "STRmix is suited for its intended use for the interpretation of profiles generated from crime scene samples."[2] (*Id*. at 76.) In a 2023 audit of the BCA Lab, the external auditors did not identify any issues with the lab's internal validation procedure for STRmix. (Govt. Ex. 10; Tr. at 110:8.) The auditors also found that the BCA Lab's procedures relating to the use of STRmix complied with the FBI Quality Assurance Standards ("QAS"). (Govt. Ex. 10; Tr. 111:15-18.) The parties, Ms. Cale, and Dr. Hoogendoorn all agree that STRmix, when used correctly and within validated parameters, is reliable. (*See* Def. Br. [Doc. No. 127] at 17 n.11; Tr. at 34:9).

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[1] ANAB is the ANSI (American National Standards Institute) National Accreditation Board. (Tr. at 107:16–18.) Labs must meet national accreditation standards to be considered minimally competent. Accreditation involves review on a four-year cycle by external subject matter experts of the lab's reports, procedures for evidence handling and storage, educational qualification requirements, quality assurance standards, and other factors. (Tr. at 107:20–108:3.) The DNA section is specifically audited externally every other year for compliance with the Federal Bureau of Investigations' ("FBI") standards for forensic DNA analysis. (Tr. at 108:8–12.)

[2] Dr. Hoogendoorn was personally involved in the internal validation process, and testified at length about the process. (*See* Tr. at 116:25–123:17.)

Dr. Hoogendoorn credibly testified as to the steps that a forensic scientist takes to complete DNA analysis after receiving a forensic sample. Ms. Cale did not dispute this general methodology. (*See* Tr. at 87:25–88:3.) First, the scientist extracts the DNA by adding buffers that release it from cells into a solution, and immediately after that, the scientist isolates the DNA within that solution, leaving behind only the purified DNA ("DNA extract"). (Tr. at 124:17–24.) The scientist then performs a quantitation step, in which he or she estimates the amount of DNA extract remaining. (Tr. at 124:25.) Based on that estimation, the scientist dilutes or concentrates the purified DNA through a process called normalization. (Tr. at 125:2–5.) Once the DNA extract has been normalized, the scientist proceeds to the amplification step, which involves using a polymerase chain reaction (PCR) process to amplify certain fragments within the DNA profile. (Tr. at 125:4–8.) BCA scientists use an amplification kit called GlobalFiler to generate amplified fragments for 24 specific locations within the DNA profile, and then those fragments are visualized on an instrument through a technique called capillary electrophoresis. (Tr. at 125:9–12.) The raw data from that process is then imported into a program called GeneMapper, which produces electropherograms that allow the scientist to visualize the profile. (Tr. at 125:13–14; 23:21–24:8.) The electropherogram is a chart representing the data graphically, with peaks at specified loci that may reflect particular alleles.[3] The height

[3] An allele is a section of DNA. Individuals possess two copies of any given allele, one inherited from each parent. Forensic DNA profiling detects either one or two alleles at each specified site for each DNA profile present in a sample, depending on whether the profile donor is a homozygote (having inherited the same allele from each parent) or

of the peaks in an electropherogram corresponds to the strength of the signal. (*See* Def. Ex. 16; Govt. Ex. 5.) Not all peaks represent true alleles—the PCR process produces a certain level of noise resulting in "artifacts" (artificial peaks) and "stutter" (repeats slightly smaller or greater than their parent peak, presenting in the data as a kind of false peak). (Tr. at 118:9–19).

Once the scientist is able to visualize the DNA profile, the scientist conducts the initial determination and interpretation steps. (Tr. at 125:17–19.) In the initial determination step, the scientist assesses the likely number of contributors to the profile, whether there are any potential higher or lower-level contributors, and whether any of the peaks can be explained as possible artifacts or stutter. (Tr. at 125:21–25.) The goal of the initial determination is to assess whether the profile is of sufficient quality to proceed to the interpretation step. (Tr. at 125:18–19.) At the interpretation step, the scientist visually compares the profile in the GeneMapper software to any known reference samples. (Tr. at 126:3–5; 127:8–11.) Finally, the scientist submits the data to STRmix, which is used for both deconvolution and comparison. (Tr. at 127:15–17.) When submitting the data into STRmix, the scientist must first make a judgment as to the number of contributors (or "donors") to the forensic sample. (Tr. at 167:6.) In the deconvolution step, the STRmix software teases apart the different DNA profiles that contributed to the mixed profile submitted. (Tr. at 127:20–22.) The scientist compares the deconvolution results with his or

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heterozygote (possessing two different alleles). (Def. Ex. 16 (A Guide to Results and Diagnostics within a STRmix Report).)

her original interpretation and checks for signs of error. (Tr. at 131:22–132:2.) Finally, in the comparison step, STRmix compares the submitted profile to any known reference samples, and generates a likelihood ratio assessing the probability that the reference sample matches a DNA profile contributing to the submitted mixture. (Tr. at 128:1–5.)

### C. The Challenged Expert Testimony

Mr. Thomas will testify as to his analysis as contained in three reports. The first report (hereinafter "Report A") presents the results from DNA profiling performed on four items on September 6, 2023, in comparison to two known DNA sources.[4] (Def. Ex. 1.) The second report (hereinafter "Report B") presents the results from DNA profiling performed on three of the same items on September 14, 2023, in comparison to a new known DNA source. (Def. Ex. 2.) The third report (hereinafter "Report C") amends portions of Reports A and B. (Def. Ex. 3.) Mr. Thomas signed all three reports. (*See* Report A; Report B; Report C).

#### 1. Report A

Report A compares the items recovered with known DNA samples provided by Mr. Ferguson and by his brother, Isaiah Ferguson. (Report A.) The results for the recovered handgun (referred to in the report, and throughout this Order, as "Item 4A") are as follows:

- This DNA profile was interpreted as a mixture originating from five individuals
- Curtis Lee Ferguson cannot be excluded as a possible contributor to this DNA mixture

[4] Unless otherwise specified, all exhibits referenced in this Order were introduced during the Court's April 8, 2024 hearing on the Defendant's *Daubert* motion.

- The probability of observing this DNA profile is greater than 100 billion times more likely if a mixture from Curtis Lee Ferguson and four unknown, unrelated individuals [is] the source than if a mixture of five unknown, unrelated individuals is the source

- Isaiah Lemuel Elis Ferguson does not appear to be a contributor to the mixture

- The probability of observing this DNA profile is 390 thousand times more likely if five unknown, unrelated individuals are the source than if Isaiah Lemuel Elis Ferguson and four unknown, unrelated individuals are the source

(*Id*.) The results for the recovered magazine (referred to in the report, and throughout this Order, as "Item 4B") are as follows:

- This DNA profile was interpreted as a mixture originating from five individuals

- Curtis Lee Ferguson cannot be excluded as a possible contributor to this DNA mixture

- The probability of observing this DNA profile is greater than 100 billion times more likely if a mixture from Curtis Lee Ferguson and four unknown, unrelated individuals [is] the source than if a mixture of five unknown, unrelated individuals is the source

- Isaiah Lemuel Elis Ferguson does not appear to be a contributor to the mixture

- The probability of observing this DNA profile is 100 billion times more likely if five unknown, unrelated individuals are the source than if Isaiah Lemuel Elis Ferguson and four unknown, unrelated individuals are the source

(*Id*.)

**2. Report B**

Report B compares the items recovered with known DNA samples provided by Mr. Ferguson's other brother, Josiah Ferguson. (Report B.) The results for Item 4A when compared with Josiah Ferguson are reported as follows:

- This DNA profile was interpreted as a mixture originating from five individuals
- Josiah Jeremiah Ferguson does not appear to be a contributor to the mixture
- The probability of observing this DNA profile is 14 billion times more likely if five unknown, unrelated individuals are the source than if Josiah Jeremiah Ferguson and four unknown, unrelated individuals are the source

(*Id*.) The results for Item 4B when compared with Josiah Ferguson are reported as follows:

- This DNA profile was interpreted as a mixture originating from five individuals
- Josiah Jeremiah Ferguson does not appear to be a contributor to the mixture
- The probability of observing this DNA profile is 100 billion times more likely if five unknown, unrelated individuals are the source than if Josiah Jeremiah Ferguson and four unknown, unrelated individuals are the source

(*Id*.)

**3. Report C**

Report C, issued on March 17, 2024, amends, in part, Reports A and B concerning the likelihood ratios for Isaiah and Josiah Ferguson as to Item 4A. (Report C.) The amended results for Item 4A when compared to these two individuals are as follows:

- The probability of observing this DNA profile is 140 million times more likely if five unknown, unrelated individuals are the source than if Josiah Jeremiah Ferguson and four unknown, unrelated individuals are the source

- The probability of observing this DNA profile is 25 times more likely if five unknown, unrelated individuals are the source than if lsaiah Lemuel Elis Ferguson and four unknown, unrelated individuals are the source.

(*Id*.)

### D. *Daubert* Hearing Testimony

Ms. Cale offered two observations that support her opinion that Mr. Thomas's results are unreliable: (1) the BCA's standards and procedures are deficient when it comes to the analysis of complex forensic DNA mixtures; and (2) in this particular case, Mr. Thomas's application of the methodology did not sufficiently account for the complexity of the mixture. (*See* Tr. at 62:19–22.)

First, with respect to the BCA standards, Ms. Cale criticized the BCA for failing to internally validate the STRmix software for use with mixtures of more than five contributors, or mixtures containing close relative donors who are likely to share more alleles. She contends that this failure leads to the underestimation of the number of contributors to forensic samples (*see* Tr. at 61:18–62:6; 63:1–7), although she further acknowledges that the results from STRmix could be reliable even if they were based on an underestimation of the number of contributors. (Tr. at 37:10–14.) However, in this case, because the BCA never validated STRmix for use with a six-person mixture, she opined that the forensic samples available would not have been suitable for deconvolution or comparison if the number of contributors had been underestimated. (Tr. at 37:16–20.)

Second, with respect to Mr. Thomas's application of the BCA standards in this case, Ms. Cale opined that Mr. Thomas underestimated the number of contributors to the forensic samples gathered from Items 4A and 4B. (Tr. at 19:24–25.) She further opined that his

underestimation resulted from his failure to account for degradation and loss of DNA from the mixture, as well as the likely presence of close relative donors in the samples. (Tr. at 48:5–8.) She opined that he should have assessed the samples as, at a minimum, six-person mixtures. (Tr. at 20:3.) Both Ms. Cale and Dr. Hoogendoorn agreed that if Mr. Thomas had assessed the samples in this case as having more than five contributors, then according to BCA standards, he should not have submitted the data to STRmix nor generated any likelihood ratios. (*See* Tr. at 31:23–24, 163:18.)

In rebuttal, Dr. Hoogendoorn testified that she agreed with Mr. Thomas's assessment that both evidentiary samples were five-person mixtures. (Tr. at 148:6.) She further described the internal validation of STRmix conducted by the BCA (Tr. at 116:25–123:17), as well as the procedures conducted by all BCA analysts after receiving a forensic sample, including the standards by which they assess the likely number of contributors. (*See* Tr. at 134:16–21.) Finally, Dr. Hoogendoorn described her review of Mr. Thomas's work in this case, which led to the amendment of his initial reports as to Item 4A. (Tr. at 140:6–142:22; *see* Report C.) She testified that the amended reports were subject to technical and administrative review, that the review did not call into question Mr. Thomas's data or results, and that he correctly followed all of the BCA's guidelines and procedures. (Tr. at 142:15–143:6.)

## II. DISCUSSION

### A. Legal Standard

Federal Rule of Evidence 702 governs the admissibility of expert testimony:

> A witness who is qualified as an expert by knowledge, skill, experience, training, or education may testify in the form of an opinion or otherwise if:
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> > (a) the expert's scientific, technical, or other specialized knowledge will help the trier of fact to understand the evidence or to determine a fact in issue;
> > (b) the testimony is based on sufficient facts or data;
> > (c) the testimony is the product of reliable principles and methods; and
> > (d) the expert has reliably applied the principles and methods to the facts of the case.

Fed. R. Evid. 702.

Under Rule 702, proposed expert testimony must satisfy three prerequisites to be admitted: (1) "evidence based on scientific, technical, or other specialized knowledge must be useful to the finder of fact in deciding the ultimate issue of fact"; (2) "the proposed witness must be qualified to assist the finder of fact," and; (3) "the proposed evidence must be reliable or trustworthy in an evidentiary sense, so that, if the finder of fact accepts it as true, it provides the assistance the finder of fact requires." *Lauzon v. Senco Prods., Inc*., 270 F.3d 681, 686 (8th Cir. 2001) (cleaned up).

These requirements reflect the Supreme Court's analysis in *Daubert*, which emphasized the district courts' gatekeeping obligations to make certain that all testimony admitted under Rule 702 "is not only relevant, but reliable." 509 U.S. at 589; *see also Kumho Tire Co., Ltd. v. Carmichael*, 526 U.S. 137, 149 (1999) (extending *Daubert* to technical and other specialized expert testimony). Under *Daubert*, the cornerstone for admissibility is assistance to the trier of fact. *See Larson v. Kempker*, 414 F.3d 936, 940–41 (8th Cir. 2005).

The Supreme Court in *Daubert* identified four non-exclusive factors that might assist a district court in determining the admissibility of expert evidence: (1) whether the theory or technique applied can be tested, (2) whether the theory or technique has been subject to peer review or publication, (3) the known or potential rate of error, and (4) whether it is accepted in the relevant discipline. *Larson*, 414 F.3d at 940 (citing *Daubert*).

Under this standard, proponents must demonstrate by a preponderance of evidence that the expert's opinion is reliable. Courts generally support "an attempt to liberalize the rules governing the admission of expert testimony," and favor admissibility over exclusion. *See Lauzon*, 270 F.3d at 686 (citation omitted) (internal quotation marks omitted); *Daubert*, 509 U.S. at 596 ("Vigorous cross-examination, presentation of contrary evidence, and careful instruction on the burden of proof are the traditional and appropriate means of attacking shaky but admissible evidence."). Doubts regarding the usefulness of an expert's testimony should be resolved in favor of admissibility. *United States v. Finch*, 630 F.3d 1057, 1062 (8th Cir. 2011).

In applying the reliability requirement of *Daubert*, the Eighth Circuit has "drawn a distinction between, on the one hand, challenges to a scientific methodology, and, on the other hand, challenges to the *application* of that scientific methodology." *United States v. Gipson*, 383 F.3d 689, 696 (8th Cir. 2004).

> The factual basis of an expert opinion goes to the credibility of the testimony, not the admissibility, and it is up to the opposing party to examine the factual basis for the opinion in cross-examination. Questions of an expert's credibility and the weight accorded to his testimony are ultimately for the trier of fact to determine. Only if an expert's opinion is so fundamentally unsupported that it can offer no assistance to the jury must such testimony be excluded.

*United States v. Rodrigues*, 581 F.3d 775, 795 (8th Cir. 2009) (quoting *Arkwright Mut. Ins. Co. v. Gwinner Oil, Inc.*, 125 F.3d 1176, 1182 (8th Cir. 1997)). Thus, when a party challenges an expert's application of otherwise reliable scientific methodology, the rule in this circuit is that "outright exclusion of the evidence in question is warranted only if the methodology was so altered by a deficient application as to skew the methodology itself." *Gipson*, 383 F.3d at 697 (internal quotations removed).

### B. Analysis

#### 1. The BCA Lab's Procedures for Assessing the Number of Contributors to a Sample

Mr. Ferguson argues that the BCA Lab's method for assessing the number of contributors to a DNA sample fails to reliably distinguish between five-person mixtures, for which the BCA Lab has validated the use of STRmix, and six-person mixtures, for which it has not validated the use of STRmix. (Def. Br. at 12-13.) Specifically, he argues that the BCA Lab's procedures provide insufficient guidance to its analysts for assessing the number of contributors to a sample and leaves it to the analysts' subjective judgments. He contends that "work[ing] under the same standard operating procedures, two different analysts could reach two different estimates about the number of contributors for the same evidentiary sample," and that, based on Ms. Cale's opinions, the analysts systematically underestimate the number of contributors to highly complex samples. (*Id*. at 13-14.) Mr. Ferguson further argues that the BCA Lab's unreliable methodology for estimating the number of contributors is not salvaged by the BCA Lab's external audits, internal

validation, or the expertise of the BCA Lab's analysts, and therefore the evidence is unreliable and must be excluded. (*Id*. at 14-17.)

The parties agree that the true number of contributors to an evidentiary or forensic sample is always unknown. (*See* Tr. 26:8-27:8; 164:14-165:2.) For that reason, DNA analysts must estimate the number of contributors to that sample. (*Id*.) The BCA Lab sets guidelines for its analysts in making that judgment, that are based on the lab's "internal validations [of] the quality assurance guidelines [in the BCA Lab's] own quality assurance manual." (Govt. Ex. 6; Tr. 137:19-21.) The BCA Lab's procedures are reviewed by external auditors and set in compliance with the FBI QAS. These procedures are devised by the Scientific Working Group of DNA Analysis Methods ("SWGDAM") and are, according to Ms. Cale, "the minimum set of standards that labs have to follow in order to participate in the national database." (Tr. 88:4-89:13.)

The BCA Lab's guidelines provide that the number of contributors in a mixed DNA sample can generally be determined "based on peak height ratios across the profile and on the locus that exhibits the greatest number of alleles at the [minimum detection threshold]." (Govt. Ex. 6. at 4.) These guidelines, in relevant part, warn analysts that "for more complex mixtures it may not be possible to use [peak height ratios] to aid in the determination of the minimum number of contributors." (*Id*.) Similarly, the guidelines warn that mixtures with more contributors may make it more difficult to identify a major contributor due to allele sharing between contributors, and make it more likely that analyzing the greatest number of alleles at a locus will underestimate the number of contributors due to "stacking." (*Id*. at 5.) The guidelines do not provide hard quantitative thresholds of mixture

complexity after which assessments based on peak height ratios or the locus with the greatest number of alleles are inadvisable. However, the guidelines do provide a standard for to how to estimate the number of contributors where there is a major mixture component. In these cases, analysts derive the total number of contributors from "the number of assumed contributors in the major mixture plus the minimum number of minor contributors. (*Id*. at 4.)

While Mr. Ferguson and Ms. Cale raise a number of challenges to the reliability of the BCA Lab's methodology, the Court finds that these challenges do not render the Government's expert testimony so unreliable as to be of no assistance to the jury. Accordingly, exclusion under Rule 702 is improper. *See Rodrigues*, 581 F.3d at 795.

First, Mr. Ferguson argues that the BCA Lab's compliance with the FBI QAS, and the Lab's proficiency testing for its employees, are insufficient to establish the reliability of its methods. This argument is not supported by the case law or facts in the record. The BCA Lab's 2023 external audit found that the lab met the relevant QAS, including qualified personnel, sufficient training, validated methods for DNA analysis, detailed analytical criteria that provide guidance to analysts for interpreting DNA samples, and regular and sufficient proficiency testing of analysts. (Govt. Ex. 10 at 7-21, 23-37, 42-45.)

Compliance with the FBI QAS is strong evidence that a lab's methodology is reliable. *See United States v. Johnson*, 56 F.3d 947, 952-53 (8th Cir. 1995) (admitting DNA expert testimony where a police department's DNA testing protocol was "substantially the same" as the "generally accepted FBI protocol"). Mr. Ferguson does not challenge the validity of the 2023 external auditor's conclusion that the BCA's policies are compliant

with the FBI QAS. (*See* Govt. Ex. 10.) Rather, his expert, Ms. Cale, argues that the QAS could be made more robust. (Tr. 89:17-22 ("The FBI QAS could be more robust with respect to guiding forensic scientists in determining the number of contributors in any given profile [and the] validation of STRmix generally.").) Ms. Cale's opinion, in this regard, is an insufficient basis on which to exclude this DNA evidence. *See United States v. Ashburn*, 88 F. Supp. 3d 239, 247 (E.D.N.Y. 2015) (collecting cases and finding agreement across district courts that a methodology accepted in the forensic science community is reliable for *Daubert* purposes, even when possible improvements to the methodology exist).

Mr. Ferguson further argues that because the BCA Lab's procedures allow for subjectivity in its analysts' assessments of DNA mixtures, specifically by not providing quantitative thresholds for when a mixture is too complex for analysts to rely on peak height ratios or maximum allele counts when estimating the number of contributors to a mixture, they are insufficient. (Def. Br. at 13.) However, the FBI QAS does not call for clear quantitative thresholds. The Court finds that the need for the exercise of scientific judgment in the application of a reliable scientific methodology does not render the methodology inadmissible for the purposes of *Daubert*. Rather, whether or not the scientist exercised proper judgment goes to the weight of the evidence. *See United States v. Romano*, 794 F.3d 317, 333 (2d. Cir. 2015) (holding that subjectivity inherent in otherwise reliable methodologies does not render the methodology unreliable, but instead goes to the weight of the evidence rather than its admissibility).

Mr. Ferguson argues that the interpretations of BCA Lab scientists are unreliable, because the proficiency testing they are evaluated on uses less complex samples than those

recovered from Items 4A and 4B. Dr. Hoogendoorn agreed that the proficiency tests used by the BCA "are not very complex" and are not as complex as the mixtures involved in this case. (Tr. at 152:10–19.) However, she notes that the proficiency tests alone do not determine an analyst's ability to assign the number of contributors to a forensic sample. (Tr. at 152:23–25.) ANAB accreditation also requires that every analyst in the Lab meet certain minimum educational qualifications and continuing education requirements. (Tr. at 107:20–108:3.) And it is undisputed that the BCA Lab's proficiency requirements meet the QAS and ANAB standards and are thus the generally accepted proficiency standards in the industry (*see* Govt. Ex. 10).

Finally, as Mr. Ferguson himself concedes, the BCA Lab's guidance cautions analysts dealing with more complex mixtures that "the minimum number of contributors as determined by the greatest number of alleles at a locus is more likely to underestimate the actual number of contributors due to allele sharing." (Govt. Ex 6 at 5.) The BCA guidance, therefore, expressly warns analysts to consider and account for this phenomenon when evaluating DNA mixtures.

**2. Mr. Thomas's Assessment of the Number of Contributors to the Forensic Samples Taken from Items 4A And 4B**

Mr. Ferguson argues that, even if the BCA Lab's procedures for assigning a number of contributors to a forensic sample are reliable in general, Mr. Thomas failed to accurately assess the number of contributors in this case. As the Eighth Circuit has instructed, when applying *Daubert*'s reliability requirement, district courts must distinguish between challenges to scientific methodology on the one hand, and challenges "to the application

of that scientific methodology" on the other. *Gipson*, 383 F.3d at 696. Having determined that the BCA Lab's procedures and methodology are reliable in general, the Court will only exclude Mr. Thomas's application of that methodology if it finds that his opinion "is so fundamentally unsupported that it can offer no assistance to the jury." *Rodrigues*, 581 F.3d at 795. Thus, the question before the Court is whether the otherwise reliable methodology "was so altered by a deficient application as to skew the methodology itself." *Gipson*, 383 F.3d at 697.

Mr. Thomas compiled case notes when he analyzed the forensic samples, which included his observations as to the individual electropherograms before he estimated the number of contributors to the samples. (Tr. at 45:4–23; Def. Ex. 5.) Mr. Ferguson directs the Court's attention to two noted observations in those case notes: (1) "degradation, dropout", and (2) that Mr. Ferguson's two brothers, Isaiah and Josiah Ferguson, were not excluded. Ms. Cale speculated that Mr. Thomas did not take those observations into account when he estimated the number of contributors for each sample. (Tr. at 48:5–8.) However, she provides no evidence to support that speculation.

Ms. Cale opined that, based on her assessment of the maximum allele counts, the peak heights and peak height ratios, and the overall quality of the DNA data, the minimum number of contributors to Item 4B is six. (*Id*. at 68:24–70:4.) She did not analyze the raw DNA data for these samples herself, and instead relied on the PDF visualizations of the data generated in the casefile for the basis of her opinion. (*Id*. at 94:11.) The heart of Ms. Cale's critique is that in the data visualization for Item 4B, at locus "FGA", there are eleven peaks. (Def. Ex. 8 at 2; Tr. at 67:16–23.) She states that, because one person can only

contribute a maximum of two alleles, finding eleven alleles at one location suggests that the sample is at least a six-person mixture. (Tr. at 67:23.)

Ms. Cale also opined that Mr. Thomas likely underestimated the number of DNA contributors because he did not take into account the potential for gene sharing between close relative donors. (Tr. at 53:3.) Specifically, if all three brothers actually contributed to the mixture, the similarity of their genes could make it appear that only one or two of them were contributors, leading to the false exclusion of one or two of them. Ms. Cale referred the Court to research indicating that the potential presence of close relative donors makes the assignment of a total number of contributors more difficult, and that gene sharing can lead to both false inclusion and false exclusion depending on whether the analyst overestimates or underestimates the number of contributors. (Tr. at 43:20–22; *see also* Def. Ex. 17.) Ms. Cale explained how, with gene sharing, three brothers' DNA could appear as only two in the electropherogram data, and argued that analysts should always increase the assignment number by one when there is a possibility of closely related individuals contributing to the mixture. (Tr. at 54:9–12.)

Dr. Hoogendoorn testified in response that one issue with looking at the data on a PDF instead of in the original software is that the data printout does not provide information on unlabeled stutter peaks, which could complicate the ability of someone looking at the data to reach an accurate estimate as to the number of contributors. (*Id*. at 158:1–23.) She explained that BCA analysts do not simply take the highest number of peaks at a locus, divide it by two, and assume that to be the number of contributors to the sample. (Tr. at 134:10–21.) Instead, the analysts consider a number of factors including the relative peak

heights, the morphology of the peaks, and the potential presence of stutter. (*Id.*; *also* Tr. at 131:5–133:24.) Dr. Hoogendoorn explained that while peaks identified as artifacts are crossed out in the data visualization, peaks interpreted as likely stutter are not, because the STRmix software will expect a certain amount of stutter and will analyze the data accordingly. (Tr. at 133:5–21.)

Dr. Hoogendoorn also roundly rejected Ms. Cale's proposal that analysts should always increase the assignment number by one when there is a possibility of closely related individuals contributing to the mixture, and explained how scientists in the BCA Lab are trained to take into account the potential presence of a close relative donor. (Tr. at 138:6–21.) In this particular case, Mr. Thomas initially considered the possibility that both brothers (Isaiah and Josiah Ferguson) contributed to the sample, based on his visual interpretation of the data. (*See* Tr. at 139:6–10; Def. Ex. 5.) Upon closer examination and comparison to known samples from both brothers, however, he determined that neither of these two brothers was a likely contributor. (Tr. at 139:10–13.) Mr. Thomas ran a likelihood ratio calculation for comparisons of the two brothers' DNA to the sample, to evaluate his interpretation. The likelihood ratios for both Isaiah and Josiah supported an exclusionary hypothesis. (Reports A, B, C.)[5]

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[5] For Item 4A, the probability of observing the DNA profile was 25 times more likely if five unknown, unrelated individuals were the source than if Isaiah Ferguson and four unknown, unrelated individuals were the source, and 140 million times more likely than if Josiah Ferguson and four unknown, unrelated individuals were the source. (Report C.) For Item 4B, the probability of observing the DNA profile was 100 billion times more likely if five unknown, unrelated individuals were the source than if Isaiah Ferguson and four unknown, unrelated individuals were the source, and 100 billion times more likely than if Josiah Ferguson and four unknown, unrelated individuals were the source. (Reports A, B.)

This is a case in which competing experts disagree as to how a reliable methodology should have been applied in a particular scenario. The Eighth Circuit has repeatedly admonished district courts "not to weigh or assess the correctness of competing expert opinions." *Johnson v. Mead Johnson & Co., LLC*, 754 F.3d 557, 562 (8th Cir. 2014). "As long as the expert's scientific testimony rests upon 'good grounds, based on what is known' it should be tested by the adversary process with competing expert testimony and cross-examination, rather than excluded by the court at the outset." *Kirk v. Schaeffler Group USA, Inc.*, 887 F.3d 376, 391 (8th Cir. 2018) (quoting *Johnson*, 754 F.3d at 562.)

The application of STRmix always starts with an analyst's interpretation of a forensic DNA sample, and the input of that scientist's judgment as to the number of contributors to the sample. (Def. Ex. 16 ("A Guide to Results and Diagnostics within a STRmix Report") at 2.) The true number of contributors to a forensic DNA sample is unknowable. (*See id.*; Tr. at 136:2–3.) "The determination of the number of contributors relies upon the analyst's knowledge, experience, and expertise to provide his or her best estimate; it is, by definition, subjective." *United States v. Lewis*, 442 F. Supp. 3d 1122, 1141 (D. Minn. 2020) (incorporating the Report and Recommendation). That does not, however, make it so unreliable as to support the exclusion of the evidence. *See Romano*, 794 F.3d at 333. Indeed, "all technical fields which require the testimony of expert witnesses engender some degree of subjectivity requiring the expert to employ his or her individual judgment, which is based on specialized training, education, and relevant work experience." *United States v. Harris*, 502 F. Supp. 3d 28, 42 (D.D.C. 2020).

The Court finds that Ms. Cale's opinions regarding the potential influence of degradation, loss, stutter, and gene sharing on the data analysis go to the weight and credibility of Mr. Thomas's expert testimony, rather than to its admissibility. "Vigorous cross-examination" and the "presentation of contrary evidence" are among the "traditional and appropriate means" of challenging admissible evidence. *In re Bair Hugger Forced Air Warming Devices Prod. Liab. Litig.*, 9 F.4th 768, 778 (8th Cir. 2021) (citing *Daubert*, 509 U.S. at 596); *see also Gipson*, 383 F.3d at 697; *Rodrigues*, 581 F.3d at 795. It is the proper role of the jury to determine the credibility of Mr. Thomas's conclusions in light of his particular application of this accepted methodology. Accordingly, the Court will not exclude Mr. Thomas's expert testimony under Rule 702.

**3. Rule 403**

In addition to the standards under Rule 702 and *Daubert*, Mr. Ferguson seeks exclusion of Mr. Thomas's testimony under Federal Rule of Evidence 403. Rule 403 permits a district court to exclude otherwise relevant evidence if its probative value is substantially outweighed by a danger of, among others, unfair prejudice or misleading the jury. Fed. R. Evid. 403. Mr. Ferguson argues that because the BCA's use of STRmix was improper, the probative value of the DNA evidence in this case is substantially outweighed by a danger that its results will mislead the jury and result in unfair prejudice.

As noted, the Court does not find that the BCA's use of STRmix in this case was improper or unreliable. Accordingly, the probative value of Mr. Thomas's testimony is not substantially outweighed by a danger of unfair prejudice or misleading the jury on that basis, and the Court declines to exclude it under Rule 403.

## III. CONCLUSION

Based on the submissions and the entire file and proceedings herein, **IT IS HEREBY ORDERED** that Defendant's *Daubert* Motion [Doc. No. 117] is **DENIED**.

Dated: May 2, 2024

/s/ Susan Richard Nelson
SUSAN RICHARD NELSON
United States District Judge